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Test 661: Oliver 990 GM Diesel

The Experiment Station
University of Nebraska College of Agriculture
W. V. Lambert, Director, Lincoln, Nebraska

Department of Agricultural Engineering
Dates of test: July 7 to 18, 1958
Manufacturer: THE OLIVER CORPORATION,
CHARLES CITY, IOWA
Manufacturer's rating: Not rated

NEBRASKA TRACTOR TEST NO. 661

OLIVER 990 GM DIESEL

FUEL, OIL, WATER and TIME Fuel Diesel **Cetane No.** 52 (rating taken from oil company's typical inspection data) **Weight per gallon** 6.998 lb **Oil** SAE 30 **To motor** 2.682 gal **Drained from motor** 1.979 gal **Water used** 0.158 gal **Total time motor was operated** 38 hours.

CHASSIS Type Standard **Serial No.** 530199 **Tread width rear** 66" **front** 59 15/16" **Wheel base** 79⅞" **Hydraulic control system** direct engine drive with throw out control **Advertised speeds mph** first 2.33 second 3.07 third 4.15 fourth 5.46 fifth 6.85 sixth 12.19 reverse first 2.55 second 4.55 **Belt pulley diam.** 12¼" **face** 9" **rpm** 1021 **Belt speed** 3277 fpm **Belt** flat **Length** 75' **Width** 8" **Thickness** 0.216" **Maximum slip** 0.99% **Clutch** single plate dry disc operated by foot pedal **Seat** pressed steel cushioned by rubber in torsion **Brakes** double disc operated by two foot pedals **Equalized** by connecting bar which serves as master brake pedal **Power take-off** direct drive with independent hand clutch **Steering** aided by hydraulic power steering.

ENGINE Make General Motors 3-71 2 cycle **Type** 3 cylinder vertical with blower **Serial No.** 3A34592 **Crankshaft mounted** lengthwise **Head** I **Lubrication** pressure **Bore and stroke** 4¼" x 5" **Rated rpm** 1800 **Compression ratio** 17 to 1 **Displacement** 213 cu. in. **Valves port diameter Inlet** multiple ports **Exhaust** 1⅜" **Governor** variable speed centrifugal **Starting system** 12 volt (two 6-volt batteries) **Air cleaner** (two used) oil washed wire mesh **Muffler** was used **Oil filter** replaceable paper element **Fuel filter** one replaceable cotton element and one replaceable paper element **Cooling medium temperature control** thermostat.

REPAIRS AND ADJUSTMENTS No repairs or adjustments.

REMARKS All test results were determined from observed data and without allowances, additions or deductions. Tests B and F were made with fuel pump set to develop approximately 88.5 corrected maximum belt horsepower and data from these tests were used in determining the horsepower to be developed in tests D and H, respectively. Tests C, D, E, G, H, J and K were made with the same setting.

BELT HORSEPOWER TESTS

Hp	Crank shaft speed rpm	Fuel Consumption: Gal per hr	Hp-hr per gal	Lb per hp-hr	Temp. Deg. F.: Cooling medium	Air wet bulb	Air dry bulb	Barometer inches of mercury
TESTS B & C—100% MAXIMUM POWER—TWO HOURS								
84.10	1800	6.291	13.37	0.523	164	70	76	28.880
TEST D—RATED POWER—ONE HOUR								
75.46	1845	5.544	13.61	0.514	152	68	70	28.870
TEST E—VARYING POWER—TWO HOURS (20 minute runs; last line average)								
75.46	1846	5.509	13.70	0.511	152	67	69	.....
1.63	1904	2.053	0.79	8.816	140	67	70	.....
38.56	1878	3.541	10.89	0.643	146	67	70	.....
84.49	1800	6.323	13.36	0.524	159	67	71	.....
19.48	1893	2.812	6.93	1.010	142	67	70	.....
57.16	1857	4.497	12.71	0.551	150	67	70	.....
46.13	1863	4.123	11.19	0.625	148	67	70	28.877

DRAWBAR HORSEPOWER TESTS

Hp	Draw bar pull lbs	Speed miles per hr	Crank shaft speed rpm	Slip of drive wheels %	Fuel Consumption: Gal per hr	Hp-hr per gal	Lb per hp-hr	Temp. Deg. F.: Cooling med	Air wet bulb	Air dry bulb	Barometer inches of mercury
TEST H—RATED POWER—TEN HOURS—3rd Gear											
61.46	5361	4.30	1855	3.70	5.021	12.24	0.572	151	62	70	29.067
TESTS F & G—100% MAXIMUM POWER											
69.92	12629	2.08	1794	14.65	1st Gear.....			158	65	76	28.960
74.18	9401	2.96	1797	7.56	2nd Gear.....			159	65	76	28.960
77.41	7068	4.11	1801	5.44	3rd Gear.....			159	65	76	28.960
76.78	5270	5.46	1796	3.86	4th Gear.....			160	68	78	28.995
75.63	4093	6.93	1796	2.88	5th Gear.....			159	68	78	28.995
70.01	2093	12.54	1806	1.58	6th Gear.....			159	68	78	28.995
TEST J—OPERATING MAXIMUM POWER											
77.37	7134	4.07	1802	7.03	3rd Gear.....			164	72	79	28.895
TEST K—SPEED-PULL CHARACTERISTIC											
Pounds Pull		5361	7068	7200	7200	7150	7150	7300			
Horsepower		61.46	77.41	71.0	63.4	55.3	47.7	38.9			
Miles Per Hour		4.30	4.11	3.7	3.3	2.9	2.5	2.0			

TIRES, WHEELS AND WEIGHT

	Tests F, G, H & K	Test J
Rear wheels		
Type	Cast iron	Cast iron
Liquid ballast	1505 lb each	None
Added cast iron	1120 lb each	None
Rear tires		
No. and size	Two 18-26	Two 18-26
Ply	8	8
Air pressure	16 lb	16 lb
Front wheels		
Type	Pressed steel	Pressed steel
Liquid ballast	118 lb each	None
Added cast iron	100 lb each	None
Front tires		
No. and size	Two 7.50-18	Two 7.50-18
Ply	6	6
Air pressure	36 lb	36 lb
Height of drawbar	16½ inches	18 inches
Static weight		
Rear end	13,180 lb	7,930 lb
Front end	3,310 lb	2,875 lb
Total weight as tested with operator	16,665 lb	10,980 lb

HORSEPOWER SUMMARY

	Drawbar	Belt
1. Sea level (calculated) maximum horsepower (based on 60°F and 29.92" Hg)	81.20	88.46
2. Observed maximum horsepower (tests F and B)	77.41	84.10
3. Seventy-five per cent of calculated maximum drawbar horsepower and eighty-five per cent of calculated maximum belt horsepower (ASAE and SAE ratings)	60.90	75.19

We, the undersigned, certify that this is a true and correct report of official Tractor Test No. 661.

L. F. LARSEN
Engineer-in-Charge

L. W. HURLBUT, Chairman
G. W. STEINBRUEGGE
J. J. SULEK
Board of Tractor
Test Engineers

EXPLANATION OF TEST REPORT

TEST A: The manufacturer's representative operates the tractor for a minimum of 12 hours using light to heavy drawbar loads in each gear.

This serves as a period for limber up, general observation and adjustments. Adjustments that are permissable include valve tappet clearance, breaker point gap, spark plug gaps, clutch and others of a similar nature. No new parts or accessories can be installed without having mention made of it in the report.

No data are recorded during this preliminary run except the time that the engine is operated.

BELT HORSEPOWER TESTS

TEST B: The manual throttle control lever is set so that the throttle valve is held wide open and the belt load on the dynamometer is adjusted so that the engine is at the rated speed recommended by the manufacturer. Carburetor, ignition timing and manifold adjustments are all set for maximum engine power.

This test is designed to determine maximum belt horsepower of the tractor at rated speed and to measure fuel consumption at the maximum power on the belt.

TEST C: For tractors with carburetors the best fuel economy does not always occur when the engine develops maximum power at rated speed. Test C is intended to allow the manufacturer's representative to select a more economical fuel setting even though there is a slight loss of power. *This more practical carburetor setting is used in all later tests except test F.* The throttle valve is wide open and load adjusted to give rated rpm. Tests B and C are the same for diesel tractors which have an altogether different fuel system.

TEST D: The manual throttle control lever is set the same as for tests B and C allowing the governor to control engine speed at part throttle. Load is applied until 85% of maximum corrected horsepower found in test B is obtained.

This rating is somewhat less than the maximum belt horsepower in order that the operator may have a certain amount of reserve.

TEST E: Varying load serves to show the range of engine speeds when the engine is controlled by the governor during the following varied loads, of 20 minutes each; rated load, no load, ½ rated load, maximum load at wide open throttle valve, ¼ and ¾ rated load.

The average result of this test shows the average power and fuel consumption. Since the average tractor is subjected to varying loads, these data serve well in predicting fuel consumption and efficiency of a tractor in general use.

DRAWBAR HORSEPOWER TESTS

In all drawbar tests the pull exerted by the tractor is transmitted by a hydraulic pressure cylinder to a recording instrument in the test car. When rubber tires are used, all tests are made on the concrete test course. The same tires, wheels and weights are used for all tests except J. All crawler type tractors are tested on an earthen test course which is maintained by grading, sprinkling and rolling so that it remains very nearly the same for each test.

TEST F: A drawbar test, the results of which are used to determine the rated drawbar horsepower in test H. The carburetor is set to develop maximum power as in test B. The rated gear recommended by manufacturer as plow gear is used in the test. The drawbar load is adjusted to give rated engine speed.

TEST G: Maximum drawbar horsepower is determined in each gear when the carburetor is set for fuel economy as in test C. The manual throttle control lever is set so that the throttle valve is held wide open and the load is applied so that the engine runs at rated engine speed.

When operating in low gear it is not uncommon for the tractor to develop less drawbar horsepower than in rated gear because of excessive wheel slippage. When excessive wheel slippage occurs the load is reduced until slippage approaches 15%. When the load is reduced it is necessary to operate the tractor engine at part throttle and control engine speed by governor action.

TEST H: Intended to test the ability of the tractor to run continuously for 10 hours at rated drawbar horsepower and to determine the fuel consumption during that time. Rated drawbar horsepower is 75% of 100% maximum drawbar horsepower (Test F), corrected to standard conditions.

When operating at rated horsepower the manual throttle control lever is set the same as in tests F and G allowing the governor to maintain engine speed at part throttle. This rating is less than maximum drawbar horsepower in order that the operator may have a certain amount of reserve.

TEST J: The tractor is operated in rated gear with all added weight removed. This test shows the effect of the removal of added weight on the performance of the tractor when compared with test G.

Removal of wheel weights generally increases wheel slippage and decreases drawbar horsepower.

TEST K: This is intended to show the pull, horsepower, and travel speed of the tractor at rated horsepower (taken from test H); maximum horsepower (taken from test G); and at least four other conditions obtained by reducing travel speed in 10% increments by overload.